CLAIMS

WHAT IS CLAIMED IS:

1. A computer modeling system comprising:

at least one input that receives parameters related to one or more electrical transmission lines, the parameters representing one or more physical characteristics and one or more electrical characteristics of the one or more electrical transmission lines;

a database with a set of one or more macromodels that use the parameters in a simulation to determine an electrical behavior of one or more of the electrical transmission lines; and

an automatic selection process that selects a macromodel from the set of macromodels to simulate one or more of the electrical transmission lines.

2. The system as set forth in claim 1, further comprising one or more outputs of the electrical behavior of one or more of the electrical transmission lines.

3. The system as set forth in claim 2, wherein the electrical behavior is one or more of the following: voltage and current waveforms at the near end and far end of each of the transmission lines.

4. The system as set forth in claim 1, wherein the electrical characteristics include one or more of the following: per-unit-length resistance, per-unit-length inductance, per-unit-length capacitance, and per-unit-length conductance.

5. The system as set forth in claim 4, wherein the one or more of the electrical characteristics is dependent on operating frequency.

6. The system as set forth in claim 1, wherein the physical characteristics include one or more of the following: transmission line length, terminating circuitry at the near and far end of the transmission line, and reference nodes for the near and far end circuitry.

7. The system as set forth in claim 1, wherein the input further receives an error threshold and a maximum operating frequency of the electrical transmission line.

8. The system as set forth in claim 1, wherein one or more of the electrical transmission lines are a multiconductor transmission line.

9. The system as set forth in claim 1, wherein the automatic selection process selects the macromodel by comparing an error threshold with a total distortion determined from maximum operating frequency of the electrical transmission line, length of the transmission line, and one or more of the electrical characteristics.

10. The system as set forth in claim 1, where the automatic selection process selects the macromodel by comparing the length of the electrical transmission line to a critical length determined from an error threshold, maximum operating frequency of the electrical transmission line input, and one or more of the electrical characteristics.

11. The system as set forth in claim 1, wherein the macromodel is selected from one of a delay extraction macromodel and a rational assumption macromodel.

12. The system as set forth in claim 1, wherein the computer system comprises a computer-aided-design (CAD) system.

13. A signal bearing medium tangibly embodying a program of machine-readable instructions executable by a digital processing apparatus to perform operations to automatically select a macromodel from a set of macromodels for use in simulating a transmission line, the operations comprising:

providing input parameters of per-unit-length resistance (R), per-unit-length inductance (L), per-unit-length conductance (G), per-unit-length capacitance (C), length (d), and maximum operating frequency (ω_{max});

computing total distortion (Δ_T) from the input parameters;

providing an error threshold (e);

comparing the total distortion with the error threshold; and

automatically selecting a macromodel based upon whether the total distortion is more or less than the error threshold.

14. The signal bearing medium as set forth in claim 13, wherein said computing total distortion is

computed according to the equation $\Delta_T = \frac{\max(\|GL - CR\|, \|LG - RC\|)}{2} d^2 \omega_{max}$.

15. The signal bearing medium as set forth in claim 13, wherein the macromodel is selected from one of a delay extraction macromodel and a rational approximation macromodel.

16. The signal bearing medium according to claim 13 used in a computer-aided-design (CAD) system.

17. A signal bearing medium tangibly embodying a program of machine-readable instructions executable by a digital processing apparatus to perform operations to automatically select a macromodel from a set of macromodels for use in simulating a transmission line, the operations comprising:

providing input parameters of per-unit-length resistance (R), per-unit-length capacitance (C), length (d), and maximum operating frequency (ω_{max}), and error threshold (ε);

computing a critical length ($d_{critical}$) from the input parameters;

comparing the length of the transmission line with the critical length; and

automatically selecting a macromodel based upon whether the length of the transmission line is less than or greater than the critical length.

18. The signal bearing medium as set forth in claim 17, wherein the critical length is calculated according the formula $d_{critical} = \sqrt{2\varepsilon/(\omega_{\max} RC)}$.

19. The signal bearing medium as set forth in claim 17, wherein the macromodel is selected from one of a delay extraction macromodel and a rational approximation macromodel.

20. The signal bearing medium according to claim 17 used in a computer-aided-design (CAD) system.